

Work: (Scientifically) [Definition]

- Amount of energy used to do a task
- doing something that makes something else do something
- amt. of energy used to when applying a number of Newtons
- effort used to start a force
- anything that uses energy
- applying force on obj. and having obj. react
- anything that put an object in motion
- Kobe

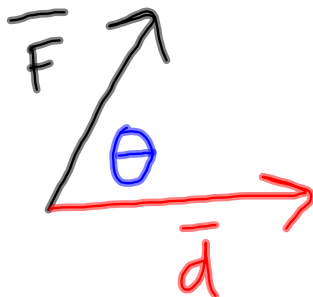
"Official" Scientific Definition of Work:

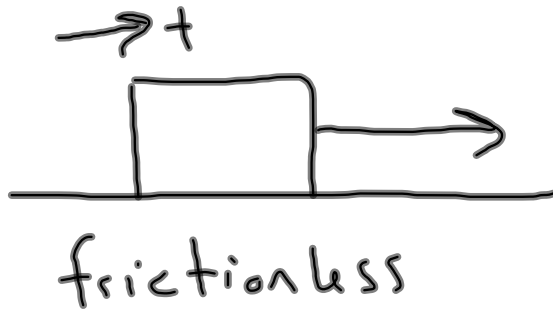
$$\begin{aligned}\text{Work} &= \overbrace{\text{Force}}^{\text{scalar}} \cdot \overbrace{\text{displacement}}^{\text{vector}} \\ &= (\text{Force})(\text{displacement}) \cos \theta\end{aligned}$$

\hookrightarrow mag. of force \hookrightarrow mag. of displacement

angle between
 \vec{F} and \vec{d}

$$[J = N \cdot m]$$



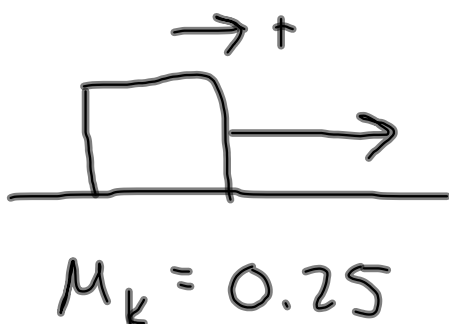


Block of $m = 20 \text{ kg}$
 Applied force $\pm 100 \text{ N}$
 displacement $\pm 2 \text{ m}$

Find net work done on the block

$$\begin{array}{c} \overrightarrow{F_A} = 100 \text{ N} \\ \hline \overrightarrow{d} = 2 \text{ m} \end{array} \quad \theta = 0^\circ$$

$$\begin{aligned} W_{\text{net}} &= \Sigma F d \cos \theta & \Sigma F &= F_A \\ &= (100 \text{ N})(2 \text{ m}) \cos(0^\circ) & &= 100 \text{ N} \\ &= 200 \text{ J} \end{aligned}$$

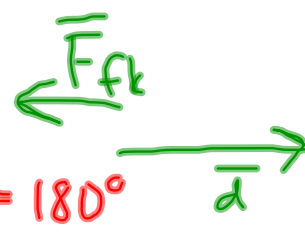
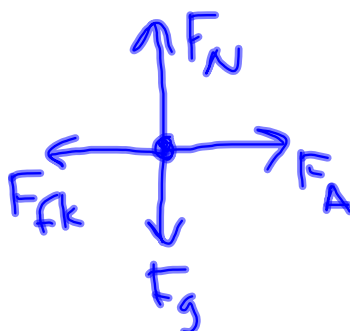
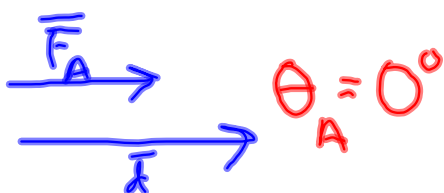


$$m = 20 \text{ kg}$$

$$F_A = +100 \text{ N}$$

$$d = +2 \text{ m}$$

find W_{net}



$$W_{\text{net}} = W_A + W_f$$

$$= F_A d \cos \theta_A + F_{fk} d \cos \theta_f$$

$$= (100 \text{ N})(2 \text{ m})(1) + (-49 \text{ N})(2 \text{ m})(-1) = 49 \text{ J}$$

~~$$= 298 \text{ J}$$~~

$$F_{fk} = \mu_k F_N$$

$$= (0.25)(196 \text{ N})$$

$$\sum \bar{F}_y = 0$$

$$F_N - F_g = 0$$

$$F_N = F_g$$

$$= m a_g$$

$$= (20 \text{ kg})(9.8 \text{ m/s}^2)$$

$$= 196 \text{ N}$$

* see notes on 10.20
for explanation of
why this is incorrect